

S/N 10/678,361

Response to Office Action mailed December 13, 2004

**Amendments to the Claims:**

This listing of claims will replace all prior versions and listings of claims in the application.

Claims 1 and 16 are amended.

Claim 42 is new.

Claims 5-15, 17, 21, and 21-41 are withdrawn.

**Listing of Claims:**

1. (Currently Amended) A duplexer comprising a laminate in which at least four dielectric layers and at least two electrode layers are laminated alternately, comprising:

a first filter for transmitting and a second filter for receiving, which are provided in the laminate and have different pass band frequencies; and

a matching circuit comprising a coupling line formed in a planar shape on one plane of a laminated layer, having one end that is short-circuited and the other end that is connected to an external terminal, provided between the first filter and the second filter, a width of the coupling line being uniform from one end to the other end,

wherein the first filter comprises at least one first stripline resonator formed in a planar shape on the one plane, having one end that is short-circuited,

the second filter comprises at least one second stripline resonator formed in a planar shape on the one plane, having one end that is short-circuited,

the external terminal connected to the coupling line is on a short-circuited side of the first filter and the second filter, and

the first stripline resonator and the second stripline resonator are coupled to the coupling line by electromagnetic field coupling.

2. (Original) The duplexer according to claim 1, wherein at least one of the first stripline resonator and the second stripline resonator has a large line width on an open end side and a small line width on a short-circuited side.

S/N 10/678,361

Response to Office Action mailed December 13, 2004

3. (Original) The duplexer according to claim 1, wherein the laminate comprises a first dielectric layer, a second dielectric layer, a third dielectric layer, and a fourth dielectric layer laminated successively,

the electrode layers include:

a first shield electrode placed on an upper surface of the first dielectric layer;

an interstage coupling capacitive electrode comprising the first filter and an input/output coupling capacitive electrode comprising the second filter, placed between the first dielectric layer and the second dielectric layer;

a first resonator electrode comprising the first filter, a second resonator electrode comprising the second filter, and a coupling line electrode comprising the matching circuit, placed between the second dielectric layer and the third dielectric layer;

an input/output coupling capacitive electrode comprising the first filter and an interstage coupling capacitive electrode comprising the second filter, placed between the third dielectric layer and the fourth dielectric layer;

a second shield electrode placed on a lower surface of the fourth dielectric layer;

at least three terminal electrodes connected to the input/output coupling capacitive electrode comprising the first filter, the input/output coupling capacitive electrode comprising the second filter, and the coupling line electrode, respectively, provided on side surfaces of the first dielectric layer, the second dielectric layer, the third dielectric layer, and the fourth dielectric layer; and

an end face electrode connecting the first shield electrode and the second shield electrode to each other.

4. (Original) The duplexer according to claim 3, wherein at least one of the first dielectric layer, the second dielectric layer, the third dielectric layer, and the fourth dielectric layer has a dielectric constant different from that of the other dielectric layers.

5. (Withdrawn) The duplexer according to claim 1, wherein at least one of the first stripline resonator and the second stripline resonator is formed on a dielectric layer different from a dielectric layer on which the coupling line is formed.

S/N 10/678,361

Response to Office Action mailed December 13, 2004

6. (Withdrawn) The duplexer according to claim 1, wherein the coupling line comprises at least two striplines having different line widths, connected to each other.
7. (Withdrawn) The duplexer according to claim 1, wherein the coupling line comprises a plurality of striplines, and the plurality of striplines are provided on different dielectric layers.
8. (Withdrawn) The duplexer according to claim 7, wherein at least one of the plurality of striplines has a line width different from that of the other striplines.
9. (Withdrawn) The duplexer according to claim 7, wherein the plurality of striplines are connected to each other by a via hole.
10. (Withdrawn) The duplexer according to claim 1, further comprising a coupling capacitor provided so as to be overlapped with the coupling line and the stripline resonator with the dielectric layer interposed therebetween.
11. (Withdrawn) The duplexer according to claim 3, further comprising an adjusting capacitive electrode provided so as to be opposed to the first shield electrode with the first dielectric layer interposed therebetween.
12. (Withdrawn) The duplexer according to claim 1, wherein the first filter and the second filter are provided so as to be opposed to each other with a shield electrode interposed therebetween.
13. (Withdrawn) The duplexer according to claim 12, wherein the laminate comprises a first dielectric layer, a second dielectric layer, a third dielectric layer, a fourth dielectric layer, a fifth dielectric layer, and a sixth dielectric layer laminated successively, and  
the electrode layers include:  
a first shield electrode placed on an upper surface of the first dielectric layer;  
an interstage coupling capacitive electrode and an input/output coupling capacitive

S/N 10/678,361

Response to Office Action mailed December 13, 2004

electrode comprising the first filter, placed between the first dielectric layer and the second dielectric layer;

a plurality of resonator electrodes comprising the first filter, placed between the second dielectric layer and the third dielectric layer;

a third shield electrode and a coupling line electrode comprising the matching circuit, placed between the third dielectric layer and the fourth dielectric layer;

a plurality of resonator electrodes and an input/output line electrode connected to the resonator electrodes comprising the second filter, placed between the fourth dielectric layer and the fifth dielectric layer;

an interstage coupling capacitive electrode comprising the second filter, placed between the fifth dielectric layer and the sixth dielectric layer;

a second shield electrode placed on a lower surface of the sixth dielectric layer;

at least three terminal electrodes connected to the input/output coupling capacitive electrode, the input/output line electrode, and the coupling line electrode, respectively, provided on side surfaces of the first dielectric layer, the second dielectric layer, the third dielectric layer, the fourth dielectric layer, the fifth dielectric layer, and the sixth dielectric layer; and

an end face electrode connecting the first shield electrode, the second shield electrode, and the third shield electrode to each other.

14. (Withdrawn) A duplexer comprising a laminate in which dielectric layers and electrode layers are laminated alternately, comprising:

a first shield electrode, a second shield electrode, a third shield electrode, and a fourth shield electrode arranged in the laminate in a lamination direction;

a first filter configured in such a manner that a plurality of stripline resonators, each having one end that is short-circuited, are adjacent to each other in parallel, placed between the first shield electrode and the second shield electrode;

a matching circuit comprising a coupling line, placed between the second shield electrode and the third shield electrode; and

a second filter that is configured in such a manner that a plurality of stripline resonators, each having one end that is short-circuited, are adjacent to each other in parallel and that has a

S/N 10/678,361

Response to Office Action mailed December 13, 2004

pass band frequency different from that of the first filter, placed between the third shield electrode and the fourth shield electrode,

wherein the second and third shield electrodes are provided with coupling windows, and the stripline resonators comprising the first and second filters and the coupling line are coupled to each other by electromagnetic field coupling via the coupling windows, respectively.

15. (Withdrawn) The duplexer according to claim 14, wherein the laminate comprises a first dielectric layer, a second dielectric layer, a third dielectric layer, a fourth dielectric layer, a fifth dielectric layer, a sixth dielectric layer, a seventh dielectric layer, and an eighth dielectric layer laminated successively,

the electrode layers include:

a first shield electrode placed on an upper surface of the first dielectric layer;

an interstage coupling capacitive electrode and an input/output coupling capacitive electrode comprising the first filter, placed between the first dielectric layer and the second dielectric layer;

a plurality of resonator electrodes comprising the first filter, placed between the second dielectric layer and the third dielectric layer;

a third shield electrode partially provided with the coupling window, placed between the third dielectric layer and the fourth dielectric layer;

a coupling line electrode comprising the matching circuit, placed between the fourth dielectric layer and the fifth dielectric layer;

a fourth shield electrode partially provided with the coupling window, placed between the fifth dielectric layer and the sixth dielectric layer;

a plurality of resonator electrodes and an input/output line electrode connected to the resonator electrodes comprising the second filter, placed between the sixth dielectric layer and the seventh dielectric layer;

an interstage coupling capacitive electrode comprising the second filter, placed between the seventh dielectric layer and the eighth dielectric layer;

a second shield electrode placed on a lower surface of the eighth dielectric layer;

at least three terminal electrodes connected to the input/output coupling capacitive

S/N 10/678,361

Response to Office Action mailed December 13, 2004

electrode, the input/output line electrode, and the coupling line electrode, respectively, provided on side surfaces of the first dielectric layer, the second dielectric layer, the third dielectric layer, the fourth dielectric layer, the fifth dielectric layer, the sixth dielectric layer, the seventh dielectric layer, and the eighth dielectric layer; and

an end face electrode connecting the first shield electrode, the second shield electrode, the third shield electrode, and the fourth shield electrode to each other.

16. (Currently Amended) A duplexer comprising a laminate in which dielectric layers and electrode layers are laminated alternately, comprising:

a first filter for transmitting and a second filter for receiving, which are provided in the laminate and have different pass band frequencies; and

a matching circuit comprising a coupling line, having one end that is opened and the other end that is connected to an external terminal, provided between the first filter and the second filter,

wherein the first filter comprises at least one first stripline resonator, having one end that is short-circuited,

the second filter comprises at least one second stripline resonator, having one end that is short-circuited,

the external terminal connected to the coupling line is on a short-circuited side of the first filter and the second filter, and

the first stripline resonator and the second stripline resonator are coupled to the coupling line by electromagnetic field coupling.

17. (Withdrawn) The duplexer according to claim 16, wherein a matching capacitive electrode is connected on an open end side of the coupling line with a dielectric layer interposed therebetween.

18. (Original) The duplexer according to claim 16, wherein at least one of the first stripline resonator and the second stripline resonator has a larger line width on an open end side and a smaller line width on a short-circuited end side.

S/N 10/678,361

Response to Office Action mailed December 13, 2004

19. (Original) The duplexer according to claim 16, wherein the laminate comprises a first dielectric layer, a second dielectric layer, a third dielectric layer, and a fourth dielectric layer laminated successively, and

the electrode layers include:

a first shield electrode placed on an upper surface of the first dielectric layer;

an interstage coupling capacitive electrode comprising the first filter and an input/output coupling capacitive electrode comprising the second filter, placed between the first dielectric layer and the second dielectric layer;

a first resonator electrode comprising the first filter, a second resonator electrode comprising the second filter, and a coupling line electrode comprising the matching circuit, placed between the second dielectric layer and the third dielectric layer;

an input/output coupling capacitive electrode comprising the first filter and an interstage coupling capacitor electrode comprising the second filter, placed between the third dielectric layer and the fourth dielectric layer;

a second shield electrode placed on a lower surface of the fourth dielectric layer;

at least three terminal electrodes connected to the input/output coupling capacitive electrode comprising the first filter, the input/output coupling capacitive electrode comprising the second filter, and the coupling line electrode, respectively, provided on side surfaces of the first dielectric layer, the second dielectric layer, the third dielectric layer, and the fourth dielectric layer; and

an end face electrode connecting the first shield electrode and the second shield electrode to each other.

20. (Original) The duplexer according to claim 19, wherein at least one of the first dielectric layer, the second dielectric layer, the third dielectric layer, and the fourth dielectric layer has a dielectric constant different from that of the other dielectric layers.

21. (Withdrawn) The duplexer according to claim 16, wherein at least one of the first stripline resonator and the second stripline resonator is formed on a dielectric layer different from a

S/N 10/678,361

Response to Office Action mailed December 13, 2004

dielectric layer on which the coupling line is formed.

22. (Withdrawn) The duplexer according to claim 16, wherein the coupling line comprises at least two striplines having different line widths, connected to each other.

23. (Withdrawn) The duplexer according to claim 16, wherein the coupling line comprises a plurality of striplines, and the plurality of striplines are provided on different dielectric layers.

24. (Withdrawn) The duplexer according to claim 23, wherein at least one of the plurality of striplines has a line width different from that of the other striplines.

25. (Withdrawn) The duplexer according to claim 23, wherein the plurality of striplines are connected to each other by a via hole.

26. (Withdrawn) The duplexer according to claim 16, further comprising a coupling capacitor provided so as to be overlapped with the coupling line and the stripline resonator with the dielectric layer interposed therebetween.

27. (Withdrawn) The duplexer according to claim 19, further comprising an adjusting capacitive electrode provided so as to be opposed to the first shield electrode with the first dielectric layer interposed therebetween.

28. (Withdrawn) The duplexer according to claim 16, wherein the first filter and the second filter are provided so as to be opposed to each other with a shield electrode interposed therebetween.

29. (Withdrawn) The duplexer according to claim 28, wherein the laminate comprises a first dielectric layer, a second dielectric layer, a third dielectric layer, a fourth dielectric layer, a fifth dielectric layer, and a sixth dielectric layer laminated successively, and  
the electrode layers include:



S/N 10/678,361

Response to Office Action mailed December 13, 2004

a first shield electrode placed on an upper surface of the first dielectric layer;  
an interstage coupling capacitive electrode and an input/output coupling capacitive electrode comprising the first filter, placed between the first dielectric layer and the second dielectric layer;  
a plurality of resonator electrodes comprising the first filter, placed between the second dielectric layer and the third dielectric layer;  
a third shield electrode and a coupling line electrode comprising the matching circuit, placed between the third dielectric layer and the fourth dielectric layer;  
a plurality of resonator electrodes and an input/output line electrode connected to the resonator electrodes comprising the second filter, placed between the fourth dielectric layer and the fifth dielectric layer;  
an interstage coupling capacitive electrode comprising the second filter, placed between the fifth dielectric layer and the sixth dielectric layer;  
a second shield electrode placed on a lower surface of the sixth dielectric layer;  
at least three terminal electrodes connected to the input/output coupling capacitive electrode, the input/output line electrode, and the coupling line electrode, respectively, provided on side surfaces of the first dielectric layer, the second dielectric layer, the third dielectric layer, the fourth dielectric layer, the fifth dielectric layer, and the sixth dielectric layer; and  
an end face electrode connecting the first shield electrode, the second shield electrode, and the third shield electrode to each other.

30. (Withdrawn) A duplexer comprising a laminate in which dielectric layers and electrode layers are laminated alternately, comprising:

a first filter for transmitting and a second filter for receiving, which are provided in the laminate and have different pass band frequencies; and

a matching circuit comprising a coupling line, provided between the first filter and the second filter,

wherein at least one of the first and second filters is a filter comprising a stripline resonator, having one end that is short-circuited, and a transmission line, having a band elimination characteristics, and

S/N 10/678,361

Response to Office Action mailed December 13, 2004

the transmission line and the coupling line are coupled to each other by electromagnetic field coupling.

31. (Withdrawn) The duplexer according to claim 30, wherein the laminate comprises a first dielectric layer, a second dielectric layer, a third dielectric layer, a fourth dielectric layer, and a fifth dielectric layer laminated successively, and

the electrode layers include:

a first shield electrode placed on an upper surface of the first dielectric layer;

an interstage coupling capacitive electrode comprising the first filter, placed between the first dielectric layer and the second dielectric layer;

a plurality of resonator electrodes comprising the first filter and a coupling line electrode comprising the matching circuit, placed between the second dielectric layer and the third dielectric layer;

an input/output coupling capacitive electrode comprising the first filter, a transmission line electrode comprising the second filter, having band elimination characteristics, and a coupling line electrode comprising a matching circuit, placed between the third dielectric layer and the fourth dielectric layer;

a resonator electrode comprising the second filter, placed between the fourth dielectric layer and the fifth dielectric layer;

a second shield electrode placed on a lower surface of the fifth dielectric layer;

at least three terminal electrodes connected to the input/output coupling capacitive electrode, the transmission line electrode, and the coupling line electrode, respectively, provided on side surfaces of the first dielectric layer, the second dielectric layer, the third dielectric layer, the fourth dielectric layer, and the fifth dielectric layer; and

an end face electrode connecting the first shield electrode and the second shield electrode to each other.

32. (Withdrawn) The duplexer according to claim 30, wherein the laminate comprises a first dielectric layer, a second dielectric layer, a third dielectric layer, a fourth dielectric layer, and a fifth dielectric layer laminated successively, and

S/N 10/678,361

Response to Office Action mailed December 13, 2004

the electrode layers include:

a first shield electrode placed on an upper surface of the first dielectric layer;

an interstage coupling capacitive electrode comprising the first filter, placed between the first dielectric layer and the second dielectric layer;

a plurality of resonator electrodes comprising the first filter and a coupling line electrode comprising the matching circuit, placed between the second dielectric layer and the third dielectric layer;

an input/output coupling capacitive electrode comprising the first filter and a transmission line electrode comprising the second filter, having band elimination characteristics, placed between the third dielectric layer and the fourth dielectric layer;

a resonator electrode comprising the second filter, placed between the fourth dielectric layer and the fifth dielectric layer;

a second shield electrode placed on a lower surface of the fifth dielectric layer;

at least three terminal electrodes connected to the input/output coupling capacitive electrode, the transmission line electrode, and the coupling line electrode, respectively, provided on side surfaces of the first dielectric layer, the second dielectric layer, the third dielectric layer, the fourth dielectric layer, and the fifth dielectric layer; and

an end face electrode connecting the first shield electrode and the second shield electrode to each other,

a part of the transmission line electrode is overlapped with the coupling line electrode with the third dielectric layer interposed therebetween in a projection in a lamination direction, and

in the projection in the lamination direction, a width of the part of the transmission line electrode is the same as or different from that of the coupling line electrode.

33. (Withdrawn) A laminate-type high-frequency device, comprising:

a duplexer comprising a laminate in which dielectric layers and electrode layers are laminated alternately; and

a semiconductor chip and/or a surface acoustic wave device mounted on an upper surface of the laminate,

S/N 10/678,361

Response to Office Action mailed December 13, 2004

wherein, as the duplexer, the duplexer of claim 1 is used.

34. (Withdrawn) Communication equipment, comprising:

an antenna; and

a duplexer for transmitting a frequency component output from a transmitting circuit to the antenna and transmitting a frequency component received from the antenna to a receiving circuit, comprising a laminate in which dielectric layers and electrode layers are laminated alternately,

wherein, as the duplexer, the duplexer of claim 1 is used.

35. (Withdrawn) Communication equipment according to claim 34, further comprising at least one selected from a semiconductor chip and a surface acoustic wave device mounted on an upper surface of the laminate.

36. (Withdrawn) A laminate-type high-frequency device, comprising:

a duplexer comprising a laminate in which dielectric layers and electrode layers are laminated alternately; and

a semiconductor chip and/or a surface acoustic wave device mounted on an upper surface of the laminate,

wherein, as the duplexer, the duplexer of claim 14 is used.

37. (Withdrawn) Communication equipment, comprising:

an antenna; and

a duplexer for transmitting a frequency component output from a transmitting circuit to the antenna and transmitting a frequency component received from the antenna to a receiving circuit, comprising a laminate in which dielectric layers and electrode layers are laminated alternately,

wherein, as the duplexer, the duplexer of claim 14 is used.

38. (Withdrawn) A laminate-type high-frequency device, comprising:

S/N 10/678,361

Response to Office Action mailed December 13, 2004

a duplexer comprising a laminate in which dielectric layers and electrode layers are laminated alternately; and

a semiconductor chip and/or a surface acoustic wave device mounted on an upper surface of the laminate,

wherein, as the duplexer, the duplexer of claim 16 is used.

39. (Withdrawn) Communication equipment, comprising:

an antenna; and

a duplexer for transmitting a frequency component output from a transmitting circuit to the antenna and transmitting a frequency component received from the antenna to a receiving circuit, comprising a laminate in which dielectric layers and electrode layers are laminated alternately,

wherein, as the duplexer, the duplexer of claim 16 is used.

40. (Withdrawn) A laminate-type high-frequency device, comprising:

a duplexer comprising a laminate in which dielectric layers and electrode layers are laminated alternately; and

a semiconductor chip and/or a surface acoustic wave device mounted on an upper surface of the laminate,

wherein, as the duplexer, the duplexer of claim 30 is used.

41. (Withdrawn) Communication equipment, comprising:

an antenna; and

a duplexer for transmitting a frequency component output from a transmitting circuit to the antenna and transmitting a frequency component received from the antenna to a receiving circuit, comprising a laminate in which dielectric layers and electrode layers are laminated alternately,

wherein, as the duplexer, the duplexer of claim 30 is used.

42. (New) The duplexer according to claim 2, wherein the first and second stripline resonators

S/N 10/678,361

Response to Office Action mailed December 13, 2004

are arranged symmetrically along a center axis.